



ANNUAL MONITORING PLAN 2022

2022

Prepared for:

info@moricetrust.ca

Prepared by:

NORTHWEST RESEARCH AND MONITORING LTD.

250.877.7858

info@nwrn.ca



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1.0 INTRODUCTION AND BACKGROUND

1.1 Morice Water Management Area

The Morice Water Management Area (MWMA) was established as part of the Morice Land and Resource Management Plan with the intent to protect the hydrological integrity, water quality, water quantity, and fisheries of the upper Morice River watershed in Wet'suwet'en traditional territory (MAL 2007). Overarching objectives for the MWMA included the development of an area-based water management plan and a water monitoring program. Initial objectives of the water monitoring program were to establish baseline data for the development of water quality objectives and guidelines.

A framework for water monitoring and assessment for the MWMA was prepared in June 2008, initial monitoring was conducted by the Office of the Wet'suwet'en (OW) in the summer of 2008, and the MWMA Multi-Year Operational Plan for water monitoring was created in 2009 (Gordon and Associates Ltd. 2009). Since 2008, there have been independent monitoring activities undertaken in the watershed by the Province, the Office of the Wet'suwet'en, and industry. These programs have focused largely on monitoring potential impacts from past disturbance or collecting baseline water quality data. While these efforts constitute a substantial amount of work accomplished within the watershed, there was need for a longer-term, scalable, and consistent program that could adapt with developing partnerships and provide opportunities for additional resources over time.

1.2 Morice Water Monitoring Trust

The Morice Water Monitoring Trust (MWMT) was established in 2012 to enable longer-term monitoring of the MWMA and establish a path forward for addressing objectives and guidelines. The MWMT is directed through its Trust Agreement to be responsible for monitoring the implementation and effectiveness of BC / Wet'suwet'en government-to-government agreements, and related natural resource management activities, plans, and policies in the MWMA (the 'Morice Plans').

One of the primary purposes of the MWMT is to gather baseline data within the MWMA to determine if water quality is sufficient to maintain the well-being of the Wet'suwet'en (in relation to fish and drinking water). The 2009 MWMA Operational Plan provided a well-structured framework for water quality monitoring and was instrumental in the development of the MWMT Monitoring Framework—a working document that provides operational guidance by defining and categorizing the anticipated risks/pressures in the watershed and sub-units, goals and objectives specific to each category, and tasks required to successfully address objectives.

In 2015, MWMT developed a Strategic Direction Plan that focused on five Core Values: Water Quantity, Water Quality, Sediment Quality, Fish and Habitat Productivity, and Information Sharing (MWMT 2015).



Figure 1. The MWMT’s five core values

The initial focus of the watershed monitoring program was to establish a scientifically valid baseline of water quality data that accounts for natural variation. Baseline data on the aquatic health necessary to support salmon and other fish includes water quality, water quantity, biology, geomorphology and connectivity data. This data collectively informs indicators of natural resource sustainability and ecosystem health identified in the Morice Plans. The role of the MWMT is to collect information related to the goals and objectives for the Morice Water Management Area and communicate this information to the Trustees, decision makers, and others as appropriate.

In 2021, the Trustees passed a motion to formally expand the geographic scope of the MWMT activities outside the MWMA initially to include the Upper Bulkley and all of the Morice basins. It is the MWMT’s intent to operate on this basis until the change is legally made.

1.3 Summary of Previous MWMT Field Programs

The following briefly summarizes MWMT field programs conducted to date and which of the four core values of water quality, water quantity, sediment quality and fish habitat and productivity are addressed:

2015 to 2017	Core Value: Water Quality
	Water quality sampling was conducted at various time steps at five sites within the MWMA with most monitoring effort being of short-term and spatially limited measurements.

2018	Core Value: Water Quality
	In 2018, the Morice Watershed Monitoring Trust (MWMT) dedicated their annual monitoring program to expanding seasonal representation of water quality surface samples collected during a previously underrepresented seasonal period of “winter” (December- March). A report was prepared for the MWMT that summarized and analyzed water quality data from the MWMT (2015-2017) and data from the BC environmental Monitoring System (EMS) database representing 37 additional sites monitored between 1996 –

	2017 (Oliver 2018). The full 2018 report can be accessed from the Morice Trust website http://moricetrust.ca/reports.php
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2019	Core Value: Water Quality
	A 5-in 30-water quality program was initiated at eight sites within the MWMA (summer). In 2019, the Morice Watershed Monitoring Trust (MWMT) dedicated their annual monitoring program to expanding seasonal representation of water quality surface samples collected during a previously underrepresented seasonal period of “summer” (July-August). An brief update report on water quality was produced with data summaries and recommendations.
	Core Value: Water Quantity
	Hydrology stations were established at Maxan Creek and Gosnell Creek.
	Core Value: Fish Habitat and Productivity
	Fourteen Canadian Aquatic Biomonitoring Network (CABIN) sites were sampled using the Sequencing the Rivers for Environmental Assessment and Monitoring (STREAM) DNA (eDNA) protocols.
	This occurred through three different field programs: MWMT (8 sites), OW (three sites), and the Ministry of Environment and Climate Change Strategy (MOECC) (three sites). The three MOECC sites were also sampled using the traditional CABIN protocols for comparative purposes.

2020	Core Value: Water Quality
	Further water quality 5-in-30 sampling was completed to fill data gaps during the summer low flow period. A follow up report (from the 2018 report) was prepared for the MWMT with additional data from the last two years and submitted for review by the MOE.
	Core Value: Water Quantity
	The water quantity (hydrology) program developed a rating curve by monitoring both stage and discharge at Gosnell and Maxan stations. A discharge-discharge relationship between the Maxan (MWMT) and Topley (OW) hydrology stations was also successfully created.
	Core Value: Fish Habitat and Productivity
	Water samples for environmental DNA (eDNA) analysis were collected at historically-known spawning grounds and nursery lakes of sockeye salmon populations in Wet’suwet’en Territory.

2021	Core Value: Fish Habitat and Productivity
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	<p>Through the Healthy Watersheds Initiative, the MWMT completed phase one of a multi-year riparian restoration project in the Upper Bulkley and Upper Morice basins:</p> <ul style="list-style-type: none"> • Ten sites along the Upper Bulkley and Maxan Creek were selected for restoration <ul style="list-style-type: none"> ○ Five were live staked with mostly Willow, as well as some Black Cottonwood, White Spruce and Western larch totalling 840 m of riverbank with an area of 6720 m³. ○ Five sites along the Upper Bulkley and Maxan Creek were first restored via low technology, process-based riparian restoration techniques, then live-staked. Restoration totaled 335 m of riverbank with an area of 2680 m³. <p>Water samples for environmental DNA (eDNA) analysis continued to be collected at historically-known spawning grounds and nursery lakes of sockeye salmon populations in Wet'suwet'en Territory.</p>
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1.4 MWMT Collaborations

The MWMT currently collaborates with several organizations in order to plan and implement our AMP. One important collaboration is with BC Freshwater Legacy, which has resulted in a part-time Watershed Coordinator position with the MWMT. The Watershed Coordinator supports communication and coordination between the Morice Water Monitoring Trust (MWMT), the Office of Wet'suwet'en (OW), the Province, and stakeholders within the watershed. They work closely with on-the-ground partners in MWMT and OW to facilitate coordination of organizations within the region, advance collaborative water monitoring initiatives, and undertake community engagement and education work. Having a dedicated watershed coordinator to bring together all the complex players, relationships and issues relating to water in the area has made great strides towards a cohesive and collaborative strategy with a goal of defining broader stakeholder values that need to be represented as water objectives and in a Water Sustainability Plan (WSP). By convening organizations for strategic meetings to align activities, leverage resources and coordinate planning, future decision-making will be improved by containing a broader perspective and knowledge base.

2.0 ANNUAL MONITORING PROGRAM- 2022

Each year an Annual Monitoring Plan (AMP) is developed to set out the year's proposed activities and budget which are created from the MWMT Monitoring Framework and is consistent with the MWMT Agreement. The 2022 AMP documents and generally describes monitoring programs that will be implemented by the MWMT, either independently or through partnerships. The Plan also contains considerations regarding integration between disciplines, and annual reporting recommendations.

The following subsections describe the components of the 2022 monitoring program. A detailed budget is provided in **Section 3.0** and a schedule is provided in **Section 4.0**.

2.1 Task 1 - Program Management

Program management activities include those functions that are necessary for the effective delivery of MWMT projects. Administrative project management duties will be performed by Northwest Research and Monitoring Ltd. (NWRM).

2.1.1 Trust Project Management

Program management tasks include:

- Prepare and update Trust management documents as directed by Trustees (present bank balance monthly, budget, quarterly variance and expense reporting – to be presented at quarterly Trustee meetings).
- Facilitate meetings. Six Trust meetings will occur each year:
 - Quarterly Trustee meetings to discuss regular MWMT operations. Meetings will occur the second week of each quarter.
 - One annual financial meeting with the RBC Securities Financial Manager.
 - One annual vision/strategic planning meeting.
- Manage Trust expenditures as defined by the AMP.
- Develop the 2022 Annual Monitoring Plan in collaboration with the Trustees:
 - Provide initial description of projects and cost estimates.
 - Facilitate discussion in relation to project selection.
- Advise Trustees as necessary on strategic and operational planning.
- The Project Manager will continue to find new opportunities to fulfill the purposes of the Trust. Research grant and partnership opportunities, and coordinate and write funding proposals.
- Liaise and collaborate with relevant stakeholders to strengthen existing and build new relationships.

2.1.1.1 Trust Project Coordination

- Prepare Trustee meeting agendas and take minutes.
- Coordinate MWMT programs with other programs occurring in 2022.

2.1.2 Office Rent and Consumables

With an increased operating budget, we expect an increase in people, meetings and storage space requirements. A physical office in the NWRM building, in addition to the boardroom, will support this increased capacity.

NWRM will provide the MWMT with an office, boardroom and storage space, as well as all utilities in a monthly rent of \$550.

2.2 Task 2 – Agreement Monitoring

As mentioned in Section 1.2 above, one of the purposes of the MWMT, as outlined in the MWMT Strategic Direction report, is to monitor the implementation and the effectiveness of any British Columbia/Wet’suwet’en government-to-government agreements, and related natural resources management activities, plans, and policies in the Morice Water Management Area (the “Morice Plans”).

The objective of this task is to conduct land use scoping within the MWMA. For 2022, the agreement monitoring process will be reviewed and recommendations made for further work. Legal obligations will be separated out from the aspirational and a review of what targets are not being met will be completed.

A ‘Needs Assessment’ for the watershed will be started that lists priority projects, a brief description of work to be done and an approximate budget to refer to with future funding opportunities.

2.3 Task 3 – Field Programs

The 2022 field programs align with the Water Quality, Water Quantity, and Fish and Habitat Productivity Core Values.

2.3.1 *Technical Advisors*

The Trust has secured trusted advisors in the fields of water quality, water quantity and hydrocarbon monitoring. A list of these resources can be obtained from MWMT administration. The Technical Advisors will assist NWRM in:

- Long and short-range planning of field programs
- Providing technical advice, such as, but not limited to:
 - General technical reviews
 - Annually reviewing all MWMA/MWMT literature and supporting documents and updating as necessary
 - Ensuring project objectives and goals are being pursued and/or achieved
 - Ensuring all data and procedures are up to provincial standards
 - Adaptively managing the program to respond to varying data, budget, and stakeholder influences.

2.3.2 *Water Quality/Quantity Monitoring*

The Core Issues of Water Quality and Water Quantity as identified in the MWMT Strategic Direction report will continue to be addressed with monitoring activities in 2022. NWRM, as MWMT administration, will continue assisting with logistics relating to field activities within the MWMA. Projects will be coordinated with OW Fisheries staff whenever possible. Safety protocols and procedures will be continually improved, adapted and implemented.

2.3.2.1 Hydrology Stations

The Project Lead will review the MWMT hydrology documents and data from previous years and assess the equipment in the field. Maintenance and data retrieval will be followed with the writing of a long-term monitoring plan for hydrology at Gosnell and Maxan Creeks.

2.3.2.3 Petroleum Product Aquatic Detection and Impact Assessment

Hydrocarbon monitoring will be researched as a new aspect of MWMT monitoring. This includes petroleum product spill tracking and impact assessment monitoring at locations in the Upper Morice basin where quantities of petroleum products are transported, stored and/or used (e.g., storage at stationary or mobile tanks, areas where there are industrial equipment and activities). Standard grab sampling and one of the most commonly used passive samplers for organic contaminants in surface-water monitoring, the semipermeable membrane device (SPMD), will be investigated for efficiency.

This program will be implemented in consecutive steps with each step influencing the next, and overall results influencing monitoring planning for the next year(s) using a continuous improvement approach. Firstly, a scientifically rigorous monitoring plan will be developed in consultation with MWMT Technical Advisors and others. A cost/benefit analysis will be a key component in determining whether to move forward. Training and monitoring will follow. Analysis and interpretation of data will support impact assessment.

2.3.3 Drinking Water Quality on Wet'suwet'en Territories

This program is focused on supporting the Wet'suwet'en living on the territories through outreach and training in drinking water monitoring. Regular updates on drinking water from preferably Wet'suwet'en technicians has been requested and aligns with the primary goals of the MWMT as stated in our Strategic Direction.

The exploratory phase will continue with the Project Lead reaching out to the camps to further assess people's needs, interest and capacity. A monitoring and a training plan will be developed and implemented involving OW technical staff (if available) and Wet'suwet'en on the territories as available. Outreach and communication will continue throughout the program.

2.3.4 Fish and Habitat Productivity eDNA Analysis

The Core Value of Fish and Habitat Productivity will continue to be addressed with the characterization of the current distribution of sockeye salmon in Wet'suwet'en traditional territory, including the upper Bulkley River and tributaries of the Morice River, and cataloguing potentially extirpated populations. Through partnerships with the OW and the University of Victoria, spawning grounds and nursery lakes of each of these populations were sampled in 2020 and 2021.

This program complements the Sockeye Salmon tagging study at OW Fisheries in understanding where the fish are spawning, how they are distributed and how the population is responding and possibly shifting distribution with climate change. Water samples for eDNA analysis will be collected at systems that have high potential to host salmon in the future. Such information can be used to quantify fisheries

interceptions, and for monitoring these populations in the Skeena Tyee Test Fishery, as well as assess the potential for strategic re-introduction programs of potentially extirpated populations.

The eDNA technology is being refined by determining limits of detection when it comes to numbers of fish, presence of adult or juvenile fish, timing of sampling and number of samples. This will be an important tool moving forward in terms of monitoring, particularly with climate change.

2.3.5 Field Work - Contingency

In 2022, a \$5000 contingency fund will be allocated to filling any data gaps necessary if they arise. For example, effectiveness monitoring of 2021 riparian restoration activities.

2.4 Task 4 – Data Management

The data management task aligns with the Information Sharing Core Value. A data management plan is in progress that adheres to the FAIR principles - Findable, Accessible, Interoperable and Re-useable. The plan also embraces OCAP principles: Ownership, Control, Access and Possession with all data being shared with the OW.

Three main tiers of data management have been identified for the MWMT:

1. Local: Project working files – internal, shared among technical partners.
2. Regional: Published files – regional external, published reports, data, discoverable.
3. Provincial: Published files – Provincially/Nationally external, large monitoring systems connected to regional published data.

Internally facing and externally facing functionality including data importing, quality control, editing, transformation, analysis, archiving and distribution are key to our decisions. Additionally, spatial enablement, the process of attaching salient geographic information to data in order to aid the discovery, querying, interpretation, visualization and downloading of that data is also vital to our principles.

2.4.1 Annual Data Management - Internal

We have adopted a standardized approach to long term data archiving, analysis, interpretation and reporting. Templates will continue to be developed for data compilation and reporting and will include provisions that address dealing with an evolving monitoring program.

Data is scanned, uploaded and organized to a secure cloud-based project management platform after each survey. Data is processed and managed through standard QA/QC procedures.

2.4.2 Annual Data Management - External

Public reports are made available on the Trust website, moricetrust.ca, as well as the Skeena Knowledge Trust's Skeena Salmon Data Center.

Funds have been allocated for fees and preparation of MWMT data to be uploaded on external databases. This aligns with the MWMT Strategic Direction document goal of providing data to support monitoring and improve further planning. Skeena Knowledge Trust (SKT), a registered Canadian charitable organization based in Smithers, BC.

2.5 Task 5 – Reporting

The reporting task aligns with the Information Sharing Core Value.

2.5.1 *Glacier Change Work*

In 2020, the Trust embarked on glacier change work with Skeena Fisheries Commission (SFC) and Coast Mountain College (CMC). The three "Work Points" lead to having projections to 2100 of the evolution of meltwater flows primarily to the Atna / Morice lake drainage and the Nanika drainage, and secondarily to other main tributary drainages to the Morice River. The first two Work Points of (1) Watershed Morphometry and (2) Current Glacier Inventory were received in 2021.

In 2022, Work Point 3: Glacier Change to 2100 which models changes in glacier extent and meltwater contributions of watersheds of concern will be completed. The funds were carried over to this budget from the previous years. Completing the work for the Upper Morice drainages concurrently with the work for the other drainages being paid for by the SFC, will allow the Trust to plan an additional multidisciplinary phase together with SFC. This phase will combine the flow predictions to 2100 with other physical, chemical and biological data to produce valuable information about how Sockeye and other salmon species in these drainages are likely to fare as headwater glaciers continue to retreat over the coming decades. This kind of information is key to making durable decisions in the context of Sockeye Recovery Planning, and other related work (e.g. potential Water Sustainability Act planning pilot).

The 2022 AMP budget carry over amount of \$5,000 for the continued glacier change work will allow for CMC to invoice for Work Point's two and three.

2.5.2 *Water Quality Objectives Formal Assessment Report*

In support of the development of WQO's for the MWMA, the formal assessment report for water quality submitted to MOE will be revised to include provincial changes and a section on OW Values.

2.5.3 *Technical Summary Reports*

Brief MWMT Technical Summary Reports will be prepared by contractors and NWRM that summarize the activities / field programs completed and will explain any deviations from the activities described in the AMP (as needed). The reports will be submitted to the Trustees and stakeholders by end of March 2022.

2.6 Task 6 – Communication and Extension

2.6.1 *Website Upgrade Maintenance*

The MWMT website will be upgraded this year to one that meets the obligations towards the extension of our research, and to better communicate our results.

2.6.2 *Presentation of Research to the Trustees and Community*

A new clause was added to MWMT contracts in 2021 requiring Contractors to prepare data in a presentation ready format for the Trustees and the Community. This fund is meant to provide for the organization and communication of our results. An increase in outreach and extension activities will occur this year with regular updates to the website and a presence on social media.

2.6.3 Charity Accounting and Annual Filings

The MWMT was registered as a charity with the Canada Revenue Agency (CRA) in 2020. Charitable status requires regular reporting, meetings and filings with the CRA.

2.6.4 Stakeholder/Funder Relations

With charity status, the MWMT will be more involved in obtaining funding and thus some funds must be put aside for any relationship building activities with funders.

2.6.5 Volunteer Incentives

With expansion of research programs and community outreach, more volunteer opportunities with the MWMT will be created. Volunteer incentives include refreshments and lunches.

3.0 BUDGET

Funding for the 2022 Annual Monitoring Program is provided by the MWMT Revenue Trust Account and external agencies (i.e., ENV) The budget provided below in **Table 1** is based on high end projections for the field work and some programs may cost less.

Table 1. Budget for the 2022 Annual Monitoring Program

Tasks	Cost
Task 1 Program Management	
Trust Project Management and Coordination	\$17,000
MWMT Office Rent and Consumables	\$6,600
Task 2 Agreement Monitoring	
Land Use Scoping	\$5,000
Task 3 Field Programs	
Technical Advisors	\$8,000
Water Quality/Quantity Sampling	\$35,000
Training and Outreach for Wet'suwet'en	\$35,000
Fish and Habitat Productivity	\$5,000
Field Work - Contingency	\$5,000
Task 4 Data Management	
Annual Data Management – Internal (data entry, compilation, formatting, QA/QC)	\$4,000
Annual Data Management – External (coordinating MWMT data with external databases)	\$2,000
Task 5 Reporting	
Glacier Change Reports	\$5,000*
Water Quality Objectives Report Revisions	\$15,000**
Technical Summary Reports	\$3,000
Task 6 Communication and Extension	
Website Upgrade and Maintenance	\$5,000
Presentation of Research	\$2,500
Charity Accounting and Annual Filings	\$5,000
Stakeholder/Funder Relations	\$4,000
Volunteer Incentives	\$1,000
Sub-total	\$163,100
BC Ministry of Environment and Climate Change Strategy Funding Contribution	(15,000)**
Total	\$148,100

* Carryover from 2021

** BC MOE funding will be applied towards the Water Quality 5-in-30 laboratory analysis costs and preparation of the Water Quality Assessment Report.

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4.0 SCHEDULE

The following outlines the proposed schedule for the 2022 field program and associated reporting. Other 2022 tasks are ongoing throughout the year and not shown. The final field schedule would be developed in collaboration with the OW and we will make every effort to ensure the final schedule coordinates efficiently with the OW Field Fisheries staff availability.

	Q1 - 2022			Q2			Q3			Q4			Q1 - 2023		
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Drinking Water															
Water Quality/ Quantity															
Fish and Habitat Productivity															
Data Management															
Reporting															

5.0 REFERENCES

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